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AIL1020

Foundations of Statistics & Probability

Instructor

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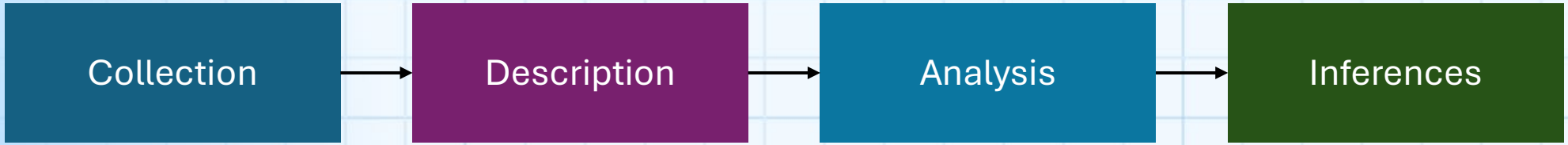
Module 01

Introduction to Statistics

Statistics

Art of learning from data



Data

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Data Collection

Design an appropriate experiment to collect data

"Which teaching style is more effective for a programming course?"

S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

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Data Collection

Design an appropriate experiment to collect data

Teaching Style 1

Group 1

Teaching Style 2

Group 2

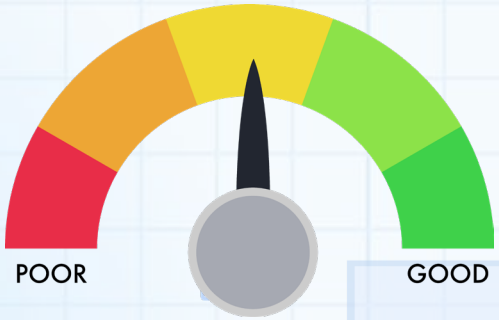
S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

Data Collection

Design an appropriate experiment to collect data

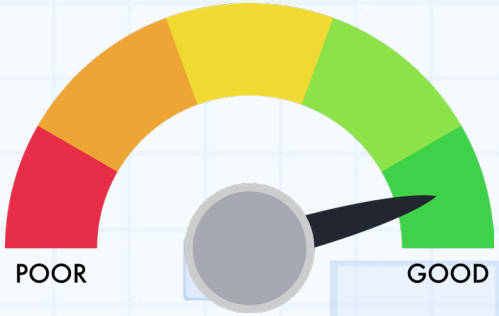
Teaching Style 1

Group 1



Teaching Style 2

Group 2



S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

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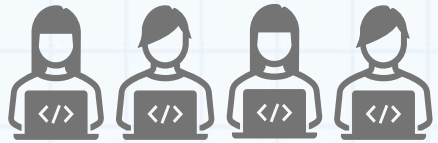
Data Collection

Teaching Style 1

Group 1

Teaching Style 2

Group 2



S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

Data Collection

"The division of the groups should be done in such a manner that all possible choices of the members of a group are equally likely."

Teaching Style 1

Group 1

Teaching Style 2

Group 2

S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

Data Description

Teaching Style 1

Group 1

Teaching Style 2

Group 2

The data should be “described”.

Scores of all students

Summary measures, like average of each group

Description and summarization of data

Descriptive Statistics

S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

Drawing inferences

Inferential Statistics

Probability

Role of "chance"

Probability

Role of "chance"

Probability

Role of "chance"

"To be able to draw logical conclusions from data, we usually make some assumptions about the chances (or probabilities) of obtaining the different data values."

Probability Model

"randomness"

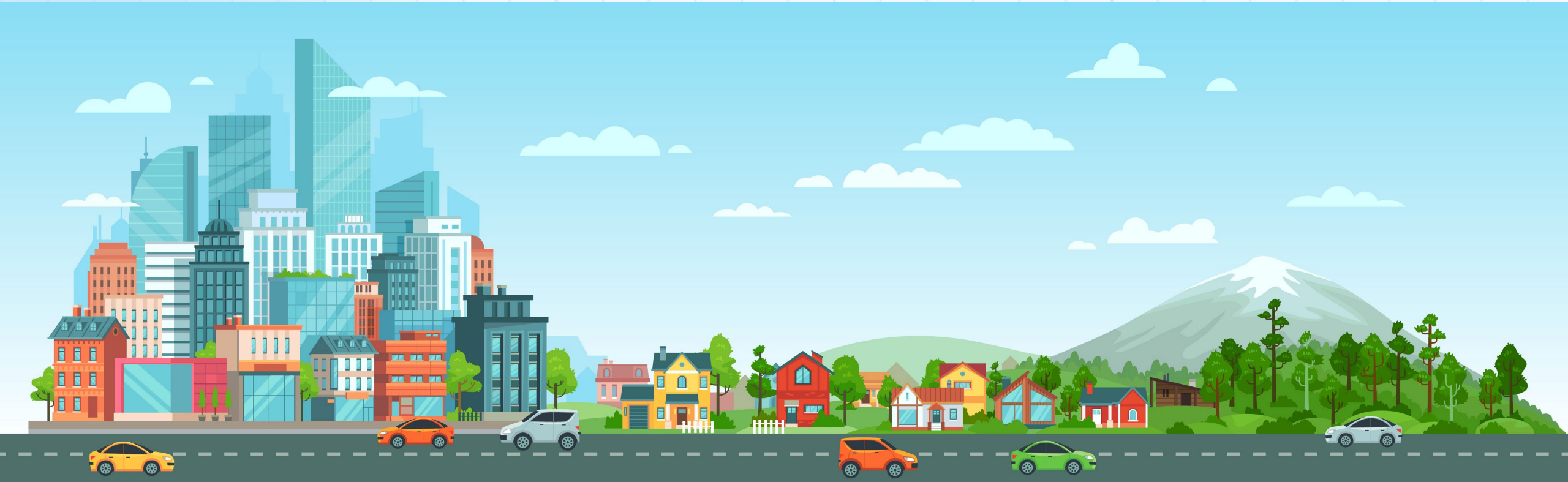
Statistical inference requires some understanding of the theory of probability.

S. M. Ross, Introduction to probability and statistics for engineers and scientists, 6th ed., London, United Kingdom: Academic Press, 2021.

Population and Samples

Population
Total collection of elements

Sample
Subgroup of the population used for examining the elements.

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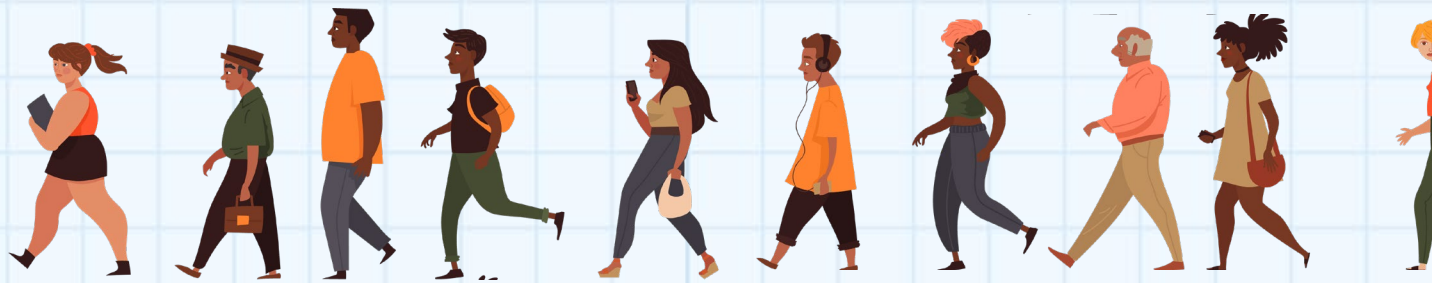
Population and Samples

If the average age of these 100 people is **42 years**, are we justified in **concluding** that this is approximately the average age of the entire population?

No

Population and Samples

In practice, a given sample generally cannot be assumed to be **representative of a population** unless that sample has been **chosen in a random manner**.



Question

An election will be held next week and, by polling a sample of the voting population, we are trying to predict whether Party A or Party B will win. Which of the following methods of selection is likely to yield a representative sample?

A. Poll all people of voting age attending a college basketball game.

B. Poll all people of voting age leaving a fancy midtown restaurant.

C. Obtain a copy of the voter registration list, randomly choose 100 names, and question them.

D. Use the results of a television call-in poll, in which the station asked its listeners to call in and name their choice.

E. Choose names from the telephone directory and call these people.

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E. Choose names from the telephone directory and call these people.

Question

The approach used in option(E) led to a disastrous prediction in the 1936 US Presidential election, in which Franklin Roosevelt defeated Alfred Landon by a landslide. A Landon victory had been predicted by the Literary Digest. The magazine based its prediction on the preferences of a
sample of voters chosen from lists of automobile and telephone owners.

Why do you think the Literary Digest's prediction was so far off?

Has anything changed between 1936 and now that would make you believe that the approach used by the Literary Digest would work better today?

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Recap

Introduction to statistics

Basic terminologies

Population --- need for **representative** and **random** samples

Coming up next...

Descriptive Statistics